

(12) UK Patent Application (19) GB (11) 2 372 203 (13) A

(43) Date of A Publication 21.08.2002

(21) Application No 0104161.5

(22) Date of Filing 20.02.2001

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(51) INT CL⁷
B60N 2/08

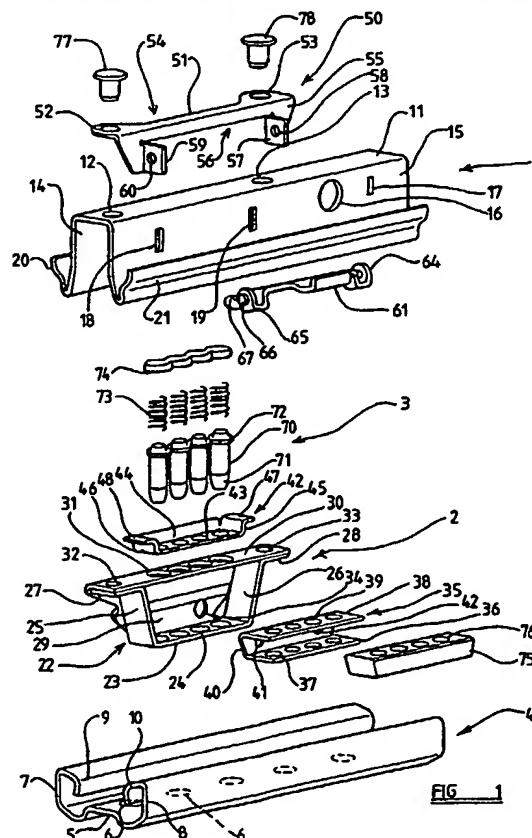
(52) UK CL (Edition T)
A4L LCC LC1 LC56 L109

(56) Documents Cited
GB 1315305 A **GB 0444752 A**
DE 004242895 C **US 6036267 A**

(58) Field of Search
UK CL (Edition S) **A4L LAAR LAAT LAL LCC**
INT CL⁷ **B60N 2/07 2/075 2/08 2/12 , B61D 33/00 ,**
B64D 11/06
Online: **EPODOC; WPI; PAJ**

(54) Abstract Title
Lock for vehicle seat support

(57) The carriage 1 for the locking pins 70 carries a housing 2. The housing 2 contains a lifting mechanism 42 comprising three metal plates 23, 30, 38 with apertures. The lower plate receives the lower end of the pins 70. The middle plate is connected to the lifting member 42 and an intermediate part of the pins. The upper plate contains a resilient downward bias, preferably a spring. When locked the pins 70 engage holes in the rail 4. The lock allows repositioning of the vehicle seat while preventing unwanted sliding.



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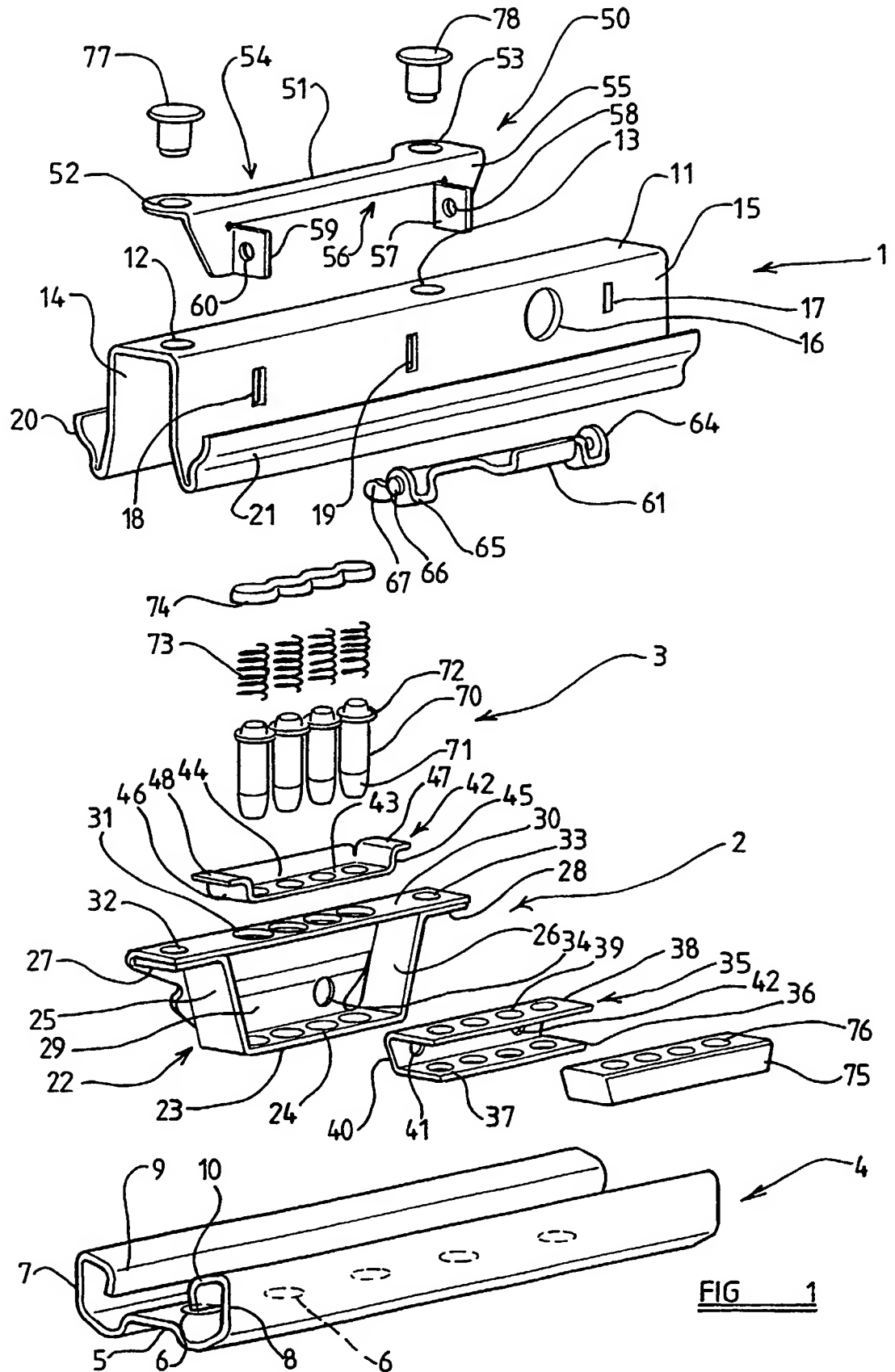
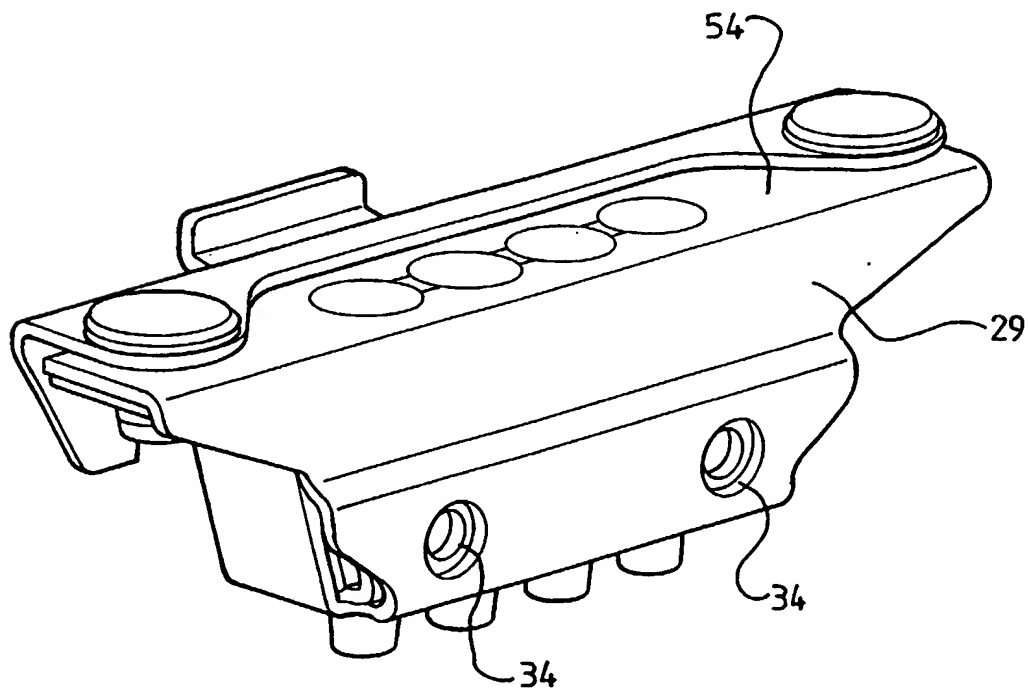
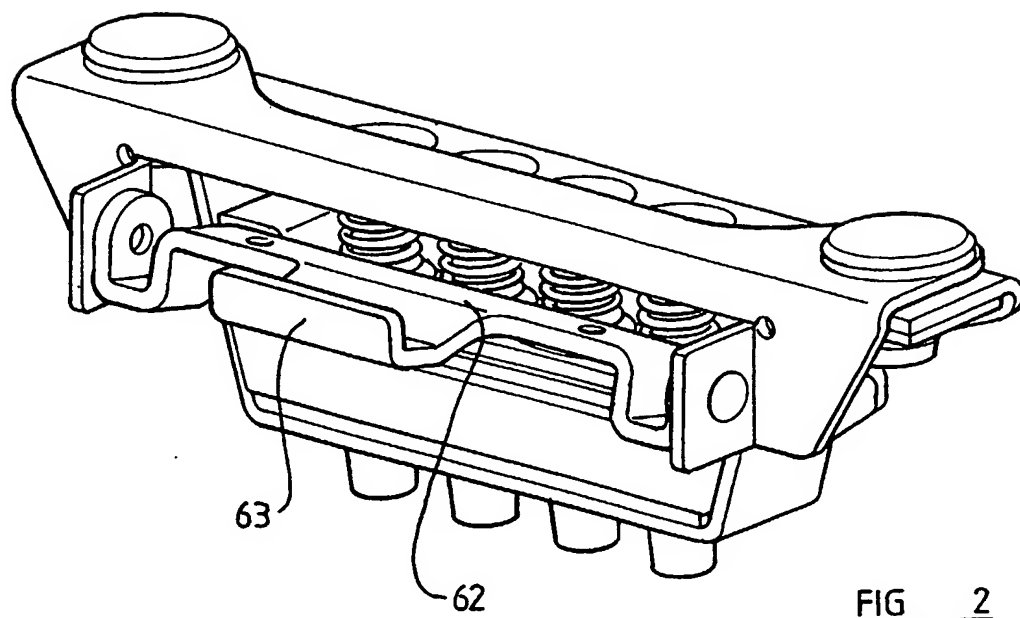
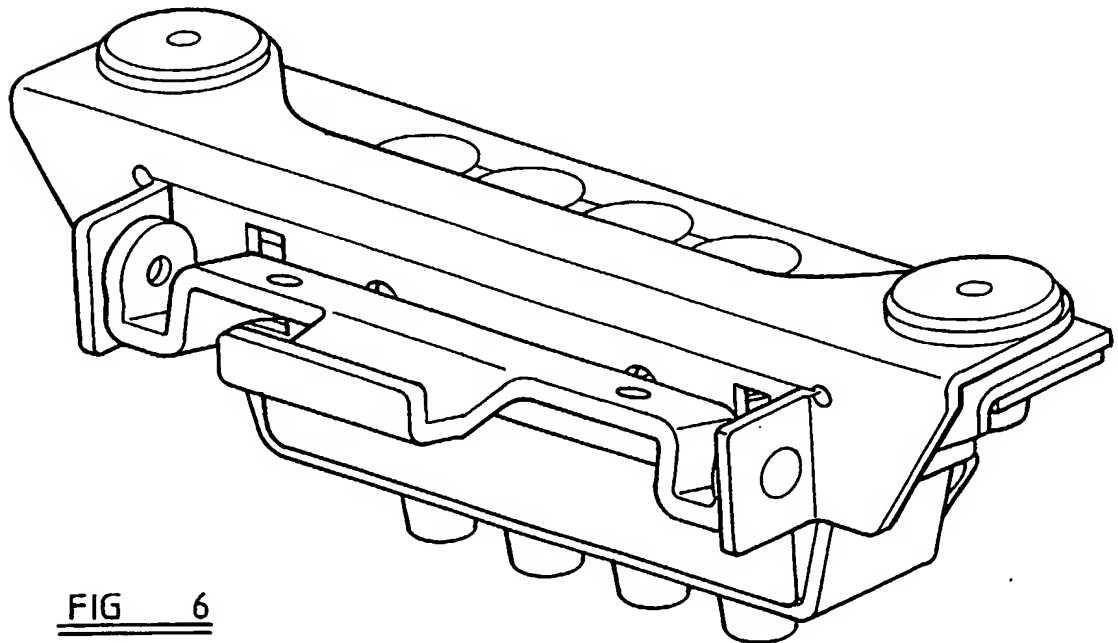
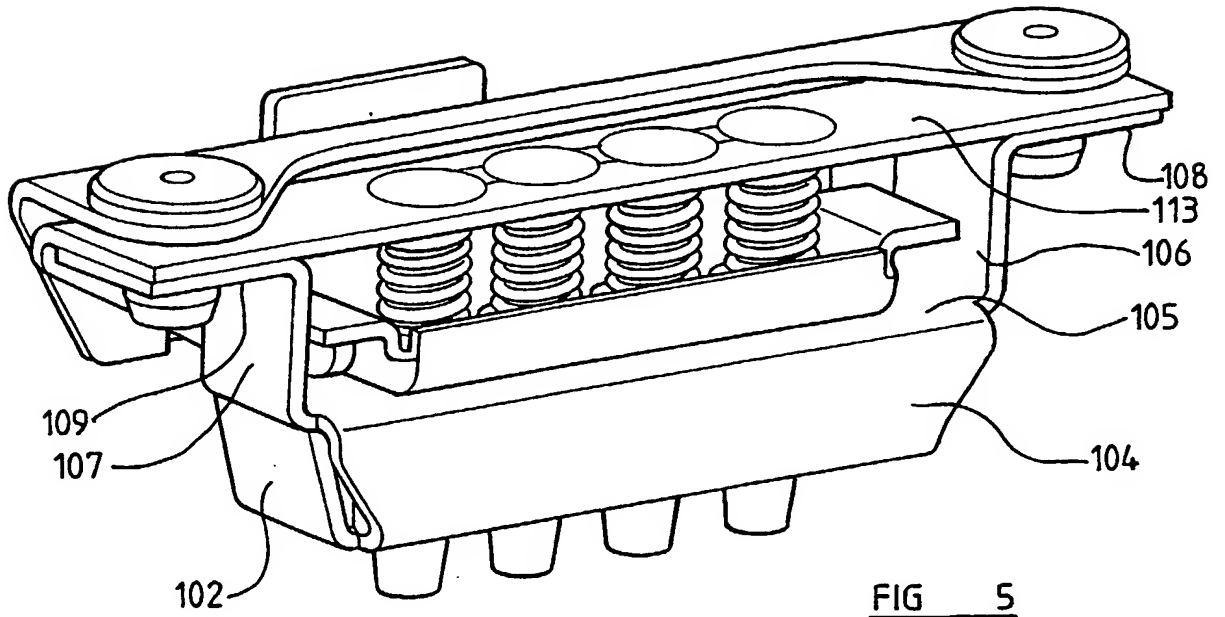


FIG 1





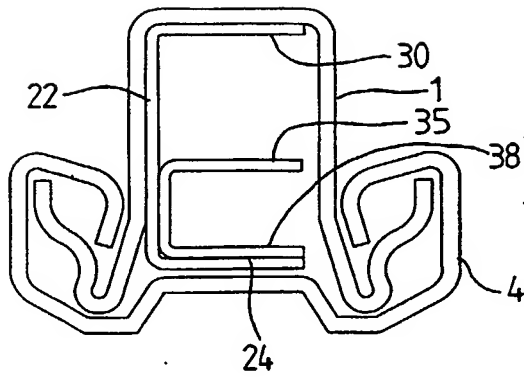


FIG 7

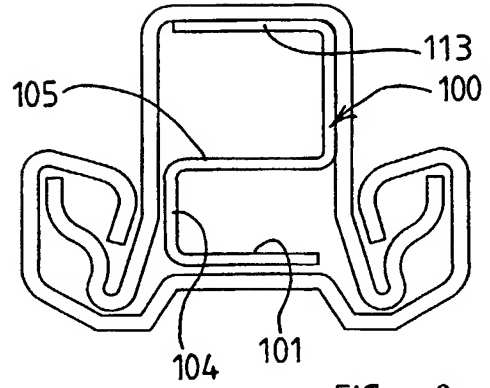


FIG 8

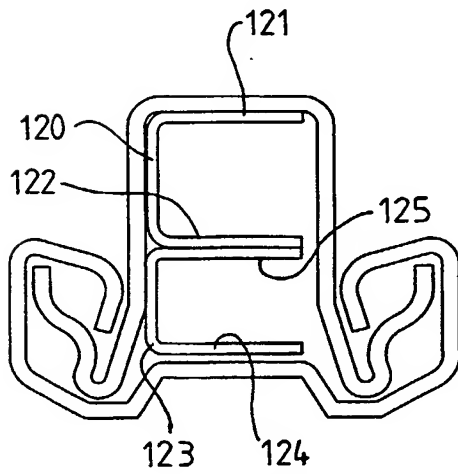


FIG 9

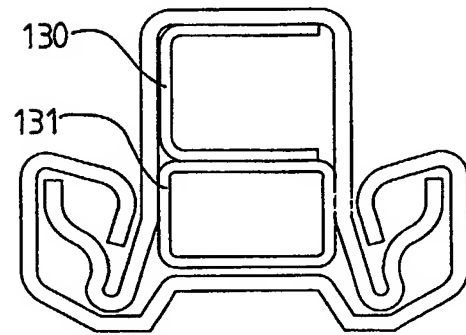


FIG 10

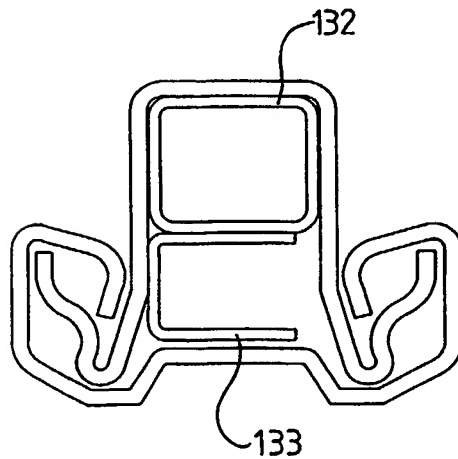


FIG 11

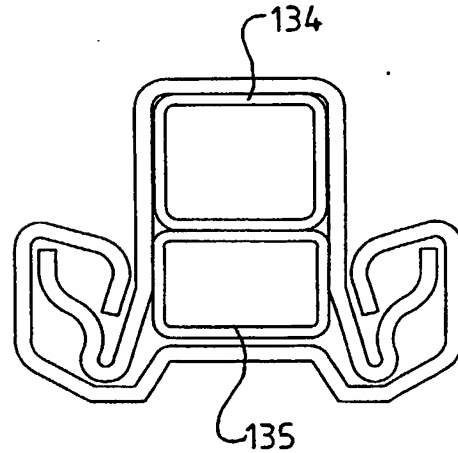


FIG 12

PATENTS ACT 1977

P14936GB-NF/jsd

DESCRIPTION OF INVENTION

**“IMPROVEMENTS IN OR RELATING TO A VEHICLE SEAT
SUPPORT”**

THE PRESENT INVENTION relates to a vehicle seat support, and more particularly relates to a vehicle seat support for use with a vehicle seat which is to be adjusted longitudinally within a motor vehicle.

It is common for at least the front seats of a motor vehicle to be mounted in position so that the positions of the seats may be adjusted longitudinally of the vehicle to enable the seats to be positioned appropriately for any driver, regardless of the length of the legs of the driver.

Many designs of vehicle support have been provided for vehicle seats of this type, and typically a separate support is provided at each side of the vehicle seat, the support comprising a carriage connected to the vehicle seat and which is slidable along a rail mounted in or on the floor of the vehicle.

It is important to be able to lock the carriage firmly in position, to prevent the seat moving longitudinally within the vehicle when the vehicle is actually in use. Also, of course, it is important that the seat should remain securely in position in the event that an accident or impact should occur.

It has been proposed, therefore, to provide the carriage with a number of spring-biased plungers which are biased downwardly, and which can be brought into engagement with apertures formed in the base of the track.

DE-4,242,895 A shows a vehicle support of this type. In the arrangement described in the Specification, the carriage, which is slidable relative to the fixed rail, is formed from a bent sheet of metal, such as steel. Mounted within the carriage is an inner housing which is of "C"-shape, having an upper flange secured to an upper part of the carriage, and having a lower flange located beneath the upper flange. Apertures are formed in the top part of the carriage, the upper flange and the lower flange to receive vehicle locking pins which are resiliently biased downwardly so that the lower-most parts of the locking pins may engage apertures formed in the base of the rail. A lifting mechanism is provided which can be used to lift the locking pins out of engagement with the rail when it is decided to move the carriage along the rail, and the locking mechanism is mounted on the upper part of the housing. The lifting mechanism being provided on top of the housing provides the described arrangement with a substantial overall height, which may prove to be inconvenient.

The present invention seeks to provide an improved vehicle seat support.

According to this invention there is provided a support for a vehicle seat of the type which is to be longitudinally adjustable within a motor vehicle, the support comprising a carriage engageable with a rail, the carriage carrying a plurality of downwardly biased locking pins adapted to engage apertures formed in the base of the rail, there being a lifting mechanism to lift the downwardly biased locking pins to facilitate movement of the carriage, the

locking pins being mounted within a housing carried by the carriage, the housing being formed of sheet metal and presenting three apertured plates or flanges at vertically spaced-apart positions, the lower-most flange being adapted to receive the lower ends of the pins, the intermediate flange receiving an intermediate part of the pins and supporting a lifting member forming part of the lifting mechanism, the upper flange engaging resilient elements which bias the pins downwardly.

Preferably the housing is formed of a single element of sheet metal, the three apertured plates or flanges being formed by different regions of the single element of sheet metal.

Conveniently the element of sheet metal defines a lower-most flange which supports an upstanding rear wall which merges with a region of sheet metal defining an intermediate flange, the intermediate flange itself merging with a portion of the element which defines a front wall, the front wall carrying the upper flange.

Preferably the part of the element defining the lower-most flange carries lower side walls which have inwardly directed flanges supporting the intermediate flange, and the intermediate flange itself carries upwardly extending side walls which have inwardly directed flanges which support the upper flange.

In an alternative embodiment the housing is formed from two components, one of the components defining at least two of the said apertured plates or flanges, and the other component defining at least one of the apertured plates or flanges.

Preferably the housing is formed from two elements, each of which presents two flanges, one flange of one element being immediately adjacent a corresponding flange of the other element to define either the lower-most flange or the intermediate flange.

In one embodiment the housing is formed from two elements, both of which are of substantially "C" section.

In an alternative embodiment the housing comprises two elements, one of which is of "C" section and the other of which is of hollow box section.

In a further alternative embodiment the housing comprises two elements each of box section.

Preferably an anti-rattle element is provided located between the intermediate flange and the lower-most flange, the anti-rattle element defining passages adapted to receive the pins.

Conveniently the lifting member supported on the intermediate flange is a lifting tray, the base of the tray defining a plurality of apertures, the apertures being dimensioned to receive parts of the pins, but having a diameter less than the diameter of a collar provided on each of the pins.

Preferably a lifter arm is provided mounted for pivotal movement, adapted to lift the lifting tray.

Advantageously the lifter arm is provided with protruding elements which engage flanges provided on the lifting tray.

Conveniently apertures are provided in the upper-most flange through which the pins may be inserted to locate the pins in position, a cover being provided to cover the apertures in the upper flange, the resilient elements engaging the covers.

Preferably each resilient element is a spring.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is an exploded view of a carriage forming a support for a vehicle seat in accordance with the invention in combination with a rail,

FIGURE 2 is a perspective view of a housing, and an associated locking mechanism, mounted within the carriage, from one side,

FIGURE 3 is a perspective view of the housing of Figure 2 from the other side,

FIGURE 4 is a view corresponding to Figure 1, but illustrating a modified embodiment of the invention,

FIGURE 5 is a view of a housing mounted within the carriage of Figure 4, from one side,

FIGURE 6 is a view of the housing shown in Figure 5, from the other side,

FIGURE 7 is a schematic cross-sectional view illustrating the formation of the rail, the carriage and the housing within the carriage of an embodiment such as that shown in Figure 1,

FIGURE 8 is a view corresponding to Figure 7, but illustrating the embodiments such as that shown in Figure 2,

FIGURE 9 is a view corresponding to Figure 7 illustrating a further modified embodiment of the invention,

FIGURE 10 is a view corresponding to Figure 7 illustrating another modified embodiment of the invention,

FIGURE 11 is a view corresponding to Figure 7 showing yet another modified embodiment of the invention, and

FIGURE 12 is a view corresponding to Figure 7 showing a further modified embodiment of the invention.

Referring initially to Figure 1, a carriage 1 is illustrated, within which is mounted an inner housing 2, which carries a plurality of locking pins 3. The carriage 1 is to be mounted for slidable movement relative to a rail 4 mounted in the floor of a motor vehicle.

The rail 4 is formed from bent sheet metal and comprises a base 5, of planar form, the base 5 being provided with a plurality of evenly spaced circular apertures 6 formed therein.

On either side of the base 5 is an upstanding flange 7, 8, each flange being provided, at its upper edge with an inwardly and downwardly extending lip 9, 10.

The carriage 1 is formed from sheet metal and comprises a planar upper part 11 which has two spaced apart apertures 12, 13 formed therein. The carriage has depending side walls 14, 15 which depend from the upper part 11 and which are provided with apertures 16, 17 to enable components of a seat to be secured to the carriage. The side wall 15 is also provided with two spaced-apart rectangular apertures 18, 19, provided for a purpose which will be described hereinafter. The depending side walls 14, 15 are each provided, at their lower edge, with a respective upwardly and outwardly directed flange 20, 21. The carriage 1 is adapted to be mounted to the rail with the flanges 20 and 21 being slidably received adjacent the side walls 7, 8, of the rail and beneath the inwardly turned lips 9, 10. Ball bearings, or similar elements to facilitate relative movement between the carriage and the track may be provided between the upwardly and outwardly directed flanges 20 and 21 of the carriage 1, and the side walls 7, 8 and associated inwardly and downwardly directed lips 9, 10.

The inner housing 2 is formed from an element 22 formed of sheet metal. The element 22 defines a planar base 23 provided with four spaced-apart circular apertures 24. The base 23 is of rectangular form. From the narrower ends of the rectangle, outwardly and upwardly extending side walls 25 and 26 extend, the side walls 25 and 26 terminating, respectively, in outwardly directed support flanges 27 and 28. The side walls and the support flanges are symmetrically arranged.

A rear wall 29 is provided which extends upwardly from one side edge of the base 23, adjacent the side walls 25 and 26. The rear wall 29 terminates,

at its upper edge, with a horizontally directed upper flange 30 which overlies, and is supported by, the support flanges 27 and 28. The upper flange 30 is provided with four spaced apart circular apertures 31 which correspond with the apertures 24, but which each have a slightly greater diameter than that of the apertures 24. The portions of the upper flange 30 which overlie and are supported by the support flanges 27 and 28, together with the support flanges 27 and 28 themselves are provided with co-aligned apertures 32 and 33. These apertures have a diameter equivalent to that of the apertures 12 and 13 provided in the upper part 11 of the carriage 1.

As can be seen more clearly from Figure 3, the rear wall 29 is provided two apertures 34 therein.

An inner housing insert 35 is provided, which again is formed from sheet metal, the inner housing insert being of generally "C" cross-section and presenting a lower apertured flange 36, having four apertures 37, which is connected to an upper apertured flange 38 which has four apertures 39 by means of a vertical web 40 which itself has two apertures 41, 42. The apertures 41, 42 are adapted to be co-aligned with the apertures 34 provided in the back wall 29 of the element 22 to receive fastening means such as rivets or screws to connect the inner housing insert 35 to the element 22. When mounted in position in this way, the lower flange 36 is in contact with the base 23 of the element 22, and the upper flange 38 is spaced above the base 23. The housing then presents, effectively, three spaced-apart apertured plates or flanges, the first plate or flange comprising, in this embodiment, the combination of the base 23 and the lower flange 36 of the inner housing element, the second plate or flange (which can be considered to be an intermediate flange) comprising the upper flange 38 of the inner housing

insert 35, and the third plate or flange comprising the upper flange 30 of the housing element 22.

A lifter tray 42 is provided which, as will be described, may be utilised to lift the locking pins. The lifter tray 42 has a planar base 43 with four evenly spaced-apart apertures 44 formed therein. The lifter tray is of rectangular form. At each narrow end of the rectangle there is an upstanding end wall 45, 46. The end wall 45 carries an outwardly directed flange 47, and the end wall 46 carries an outwardly directed flange 48. The lifter tray is intended initially to be supported by the upper flange 38.

A lifter arm support 50 is provided comprising an upper planar region 51 defining two spaced apart apertures 52, 53, these apertures being of a size corresponding to the size of the apertures 12 and 13 as formed in the upper part 11 of the housing 2, and thus also corresponding in size with the apertures 32 and 33 as formed in the housing element 22. A substantial part of the planar upper region 51, between the apertures 52 and 53 is cut-away to form a cut-away 54.

At the side edge of the upper planar region 51 which is not cut-away, there is a depending side wall 55. A central region of the depending side wall 55 is cut-away 56, and at each side of the cut-away region 56 there is a tab. Each tab extends vertically, being directed away from the lifter arm support 50 in a plane which is perpendicular to the plane of the depending side wall 55. A first tab 57 is provided with an aperture 58, and a second tab 59 is provided with an aperture 60.

A lifter arm 61 is provided, again formed from a sheet metal element. The lifter arm has a cross-bar 62 of rectangular form. Provided at a central

position on the cross-bar 62 is an actuating tab 63 (see Figure 2). At each end of the cross-bar 62, an upwardly directed lug 64, 65 is provided, each lug having an outwardly directed trunion, such as the trunion 66. The trunions are adapted to be received within the apertures 58 and 60. Adjacent the upstanding lugs 64 and 66 are forwardly directed fingers 67 which, as will be described, will engage the outwardly directed flanges 47, 48 provided on the end walls 45, 46 of the lifting tray 42.

The locking pins 3 comprise four identical locking pins 70. Each locking pin is of cylindrical form having a slightly tapered lower end 71. Adjacent the upper end of each locking pin is an outwardly directed flange 72 having a diameter slightly greater than the overall diameter of the locking pin. A separate resilient helical spring 73 is associated with each pin being located above each pin. A cover element 74 is provided adapted to retain the springs 73, as will now be described.

An optional anti-rattle element 75 formed of an appropriate plastics material may be provided. This element is in the form of a rectangular block defining a plurality of bores 76 therethrough. The block may be inserted in the inner housing insert 35 between the flanges 36 and 38, with the bores 76 aligned with the apertures formed in the flanges 36 and 38.

In assembling the components of the carriage, initially the inner housing insert 35 is secured in place within the housing element 22 by passing rivets or the like through the co-aligned apertures 34 and 41, 42. The anti-rattle block 75 may be placed in position. The lifting tray will be loosely placed on top of the upper flange 38 of the inner housing element 35, and the pins 70 will be lowered into position from above the housing, with the pins passing initially through the apertures 31 formed in the upper flange 30. The apertures 44

formed in the lifting tray 42, and the apertures 39 formed in the upper flange 38, and the apertures 37 formed in the lower flange 36 of the inner housing insert 35, (also passing through the bores 76 of the anti-rattle element 75 if it is provided) and the apertures 24 formed in the base 23 of the housing element 22. All of the apertures and bores (except apertures 31) are of a diameter such as to snugly receive the pins 70. The flanges 72, however, will not pass through the apertures 44 formed in the lifting tray 52. The flanges 72 will, however, pass through the apertures 31 formed in the upper flange 30, since these apertures are of a greater diameter than the diameter of the other apertures.

When the pins have been located in position, the cover element 74 is snapped into position to seal off the apertures 31 as formed in the flange 30. The cover 74 may be snapped in position from beneath the upper flange 30. The resilient springs 73 are then compressed and located in position so as to bias the pins downwardly. The lifter arm support 50 is then mounted in position on the housing, with the apertures 52 and 53 in the upper horizontal part 51, aligned with the apertures 32 and 33 in the upper flange 30. The cut-out 54 is located so that it does not obstruct the apertures 31.

The assembled housing may then be located in position in the carriage, being inserted into the open bottom of the carriage being moved upwardly between the side walls 14 and 15 of the carriage until the upper part of the housing, as constituted by the horizontal part 51 of the lifter arm support 50 abuts against the under-surface of the upper part 11 of the carriage 1. The apertures 52 and 53 are brought into alignment with the apertures 12 and 13, and the apertures 32 and 33 are also in alignment. At this stage, the tabs 57, 59 protrude outwardly through the apertures 18, 19 formed in the side wall 15 of the carriage 1. Rivets 77, 78 may be passed through the co-aligned

apertures 12, 52, 32 and 13, 53, 33 to secure the housing in position. The lifter arm 61 may then be mounted in position with the forwardly extending lugs 67 being passed through the apertures 18, 19 to engage under the flanges 47, 48 carried by the lifter tray 42, with the trunions 66 being snap-fitted into the apertures 58, 60 provided on the tabs 57, 59 which project through the apertures 18, 19.

It is to be appreciated that the cross-bar 62 and the operating tab 63 are thus located on the exterior of the carriage 1.

It is to be understood that the spring 73 will bias the pins 70 downwardly, and then any pin 70 has its tapered lower end 71 in alignment with an aperture 6 as formed in the base 5 of the rail 4, the appropriate spring 73 will drive that pin 70 downwardly thus serving to lock the carriage in position relative to the rail 4. Should, however, it be desired to release the carriage so that the carriage may slide along the rail, the operating tab 63 may be depressed, causing the lifter arm 61 to pivot about the axis defined by the trunions 66. The fingers 67 will thus move upwardly and will engage underneath the flanges 47, 48 carried by the end walls 45, 46 of the lifter tray 42. The lifter tray 42 will thus be lifted, and the base 43 of the lifter tray will engage underneath the flanges 72 provided on the pins 70, serving to lift any of the pins 70 that have previously moved downwardly, thus moving the pins against the resilient bias imparted thereto by the springs 73. When all of the pins have been lifted to such an extent that the tapered ends 71 of the pins are all disengaged from the apertures 6 provided in the rail 4, the carriage 1 may slide relative to the rail 4.

It is to be appreciated that in the described embodiment the upper flange 30 carries the cover 74 which forms an abutment for the springs 73. The

upper flange 38 of the inner housing element 35 provides a support for the lifter tray. The co-aligned lower flange 36 of the inner housing 35 and the immediately adjacent base 23 of the housing element 22 define apertures which guide the pins and which will absorb any initial force applied to the pins in the event that the carriage should move forwardly, or rearwardly, for example in an accident situation, whilst being locked in position.

The described arrangement is compact, and is manufactured economically.

The anti-rattle block 75, as well as minimising the rattle, may serve to transfer force absorbed by one pin 70 to the adjacent pins, thus reducing the risk of premature damage occurring to the described components.

In the embodiment of Figures 1 to 3, the inner housing 2 formed from the described element 22 which forms the base 23 and the upper flange 30, and the inner housing insert 35 which forms the upper flange 38.

Figure 4 illustrates an alternative embodiment of the invention in which the housing 2 is formed from a single element 100 which forms an aperture base 101, the ends of which are provided with upstanding lower end walls 102, 103 which, in this embodiment, have inwardly directed support flanges (not shown). The end walls 102, 103 have a much lesser height than the end walls 25, 26 described above. A rear wall 104 is provided which extends upwardly from one side of the base 101 to a level of the walls 102, 103. The rear wall 104 is connected to a plate which extends horizontally across the inwardly directed walls 102, 103 to form an intermediate plate 105. The ends of the intermediate plate 105 carry respective upstanding upper end walls 106, 107, with these end walls carrying outwardly directed support flanges 108, 109.

One edge of the intermediate plate 105 carries an upstanding front wall 110, which has rectangular apertures 111, 112 formed therein. The front wall 110 carries, at its upper edge, a rearwardly directed upper flange 113, which extends across and is supported by the outwardly directed flanges 108, 109. The base 101, the intermediate plate 105 and the upper flange 113 are provided with apertures, and it will readily be understood that the base 101 corresponds with the base 23 of the embodiment of Figure 1, the intermediate plate 105 corresponds with the upper flange 38 of the inner housing insert 35 of the embodiment of Figure 1, and the upper flange 113 corresponds with the upper flange 30 of the housing element of the embodiment of Figure 1. The apertures 111 and 112 are provided in the front wall to be co-aligned with the apertures 18, 19 as formed in the carriage 1 so as to permit the lugs 67 mounted on the lifter arm 61 to engage under the outwardly directed flanges 47, 48 provided on the lifter tray 42.

The remaining components of the described apparatus are the same as, and perform the same function as, in the embodiment of Figures 1 to 3.

It will be appreciated that Figure 7 is a schematic cross-section of the embodiment of Figure 1 illustrating the rail 4, the carriage 1, the housing element 22 and the inner housing element 35. Similarly Figure 8 is a cross-section of the embodiment of Figure 4 showing, in this case, the housing element 100 with its base 101, the intermediate plate 105 and upper flange 113. It is to be appreciated that alternative configurations of housing may be provided which present the three spaced-apart apertured flanges or plates present in the embodiments of Figures 1 to 4 as described above. For example, as shown in Figure 9, two substantially "C"-shaped elements could be used to form the housing, an upper element 120 presenting an upper flange 121, and an

upper intermediate flange 122, with a lower element 123 defining a lower flange 124 and a lower intermediate flange 125. The two intermediate flanges 122 and 125 would abut each other and would act as a single plate or flange. Similarly, as shown in Figure 10, the housing may comprise an upper "C"-shaped element 130, and a lower square cross-section element 131. The position of such elements may be reversed, and as shown in Figure 11 there is an upper square-shaped element 132 and a lower "C"-shaped element 133. Of course, two square-shaped elements may be used as shown in Figure 12 as upper square-shaped element 134, and lower square-shaped element 135.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. A support for a vehicle seat of the type which is to be longitudinally adjustable within a motor vehicle, the support comprising a carriage engageable with a rail, the carriage carrying a plurality of downwardly biased locking pins adapted to engage apertures formed in the base of the rail, there being a lifting mechanism to lift the downwardly biased locking pins to facilitate movement of the carriage, the locking pins being mounted within a housing carried by the carriage, the housing being formed of sheet metal and presenting three apertured plates or flanges at vertically spaced-apart positions, the lower-most flange being adapted to receive the lower ends of the pins, the intermediate flange receiving an intermediate part of the pins and supporting a lifting member forming part of the lifting mechanism, the upper flange engaging resilient elements which bias the pins downwardly.
2. A support according to Claim 1 wherein the housing is formed of a single element of sheet metal, the three apertured plates or flanges being formed by different regions of the single element of sheet metal.
3. A support according to Claim 2 wherein the element of sheet metal defines a lower-most flange which supports an upstanding rear wall which merges with a region of sheet metal defining an intermediate flange, the intermediate flange itself merging with a portion of the element which defines a front wall, the front wall carrying the upper flange.
4. A support according to Claim 3 wherein the part of the element defining the lower-most flange carries lower side walls which have inwardly directed

flanges supporting the intermediate flange, and the intermediate flange itself carries upwardly extending side walls which have inwardly directed flanges which support the upper flange.

5. A support according to Claim 1 wherein the housing is formed from two components, one of the components defining at least two of the said apertured plates or flanges, and the other component defining at least one of the apertured plates or flanges.

6. A support according to Claim 5 wherein the housing is formed from two elements, each of which presents two flanges, one flange of one element being immediately adjacent a corresponding flange of the other element to define either the lower-most flange or the intermediate flange.

7. A support according to Claim 6 wherein the housing is formed from two elements, both of which are of substantially "C" section.

8. A support according to Claim 6 wherein the housing comprises two elements, one of which is of "C" section and the other of which is of hollow box section.

9. A support according to Claim 6 wherein the housing comprises two elements each of box section.

10. A support according to any one of the preceding Claims wherein an anti-rattle element is provided located between the intermediate flange and the lower-most flange, the anti-rattle element defining passages adapted to receive the pins.

11. A support according to any one of the preceding Claims wherein the lifting member supported on the intermediate flange is a lifting tray, the base of the tray defining a plurality of apertures, the apertures being dimensioned to receive parts of the pins, but having a diameter less than the diameter of a collar provided on each of the pins.
12. A support according to Claim 11 wherein a lifter arm is provided mounted for pivotal movement, adapted to lift the lifting tray.
13. A support according to Claim 12 wherein the lifter arm is provided with protruding elements which engage flanges provided on the lifter tray.
14. A support according to any one of the preceding Claims wherein apertures are provided in the upper-most flange through which the pins may be inserted to locate the pins in position, a cover being provided to cover the apertures in the upper flange, the resilient elements engaging the covers.
15. A support according to any one of the preceding Claims wherein each resilient element is a spring.
16. A support for a vehicle seat substantially as herein described with reference to and as shown in Figures 1 to 3 and 7 of the accompanying drawings.
17. A support for a vehicle seat substantially as herein described with reference to and as shown in Figures 4 to 6 and 8 of the accompanying drawings.

18. A support for a vehicle seat substantially as herein described with reference to and as shown in Figure 9 of the accompanying drawings.

19. A support for a vehicle seat substantially as herein described with reference to and as shown in Figure 10 of the accompanying drawings.

20. As shown in Figure 11 of the accompanying drawings.

21. As shown in Figure 12 of the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0104161.5
Claims searched: 1-21

Examiner: Robert Black
Date of search: 26 April 2001

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Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4L LCC, LAAR, LAL, LAAT

Int Cl (Ed.7): B60N 2/08, 2/07, 2/075, 2/12; B61D 33/00; B64D 11/06

Other: Online: EPODOC; WPI; PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 1315305 A (TELEFLEX) see figures 1 and 3	1 and 15
A	GB 444752 A (CHAPMAN) see figures and page 3 line 123 to page 4 line 89	1 and 15
A	US 6036267 A (DOWNEY) see figures 2-5 and column 1 line 41 to column 2 line 2	1 and 15
A	DE 4242895 C (MERCEDES) see figures	1 and 15

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.